Art. I.—*Victoria as a Field for Geologists.*

By Thomas Harrison, Esq.

[Read 22nd May, 1865.]

There is a strong disposition abroad to underrate whatever appertains to the circle immediately around us. The term "colonial" has long been regarded as one of contempt. We mentally, if not openly, despise everything to which the objectionable adjective can be attached, from colonial legislative assemblies down to colonial ale and porter.

I should have left this matter unnoticed, especially in the Hall of the Royal Society, but not a few persons seem disposed to take like views of scientific phenomena witnessed in this part of the globe, as though colonial laws of nature were something different from, and not to be spoken of in the same breath with, similar laws as manifested in older communities.

I shall leave it to Mr. Ellery to say whether there is nothing worth examining in our heavens; to Professor M'Coy to tell us if he discovers aught worth noticing in our fauna; to Dr. Mueller to stand forth as the champion of our botany; and to doctors of medicine generally, to witness if our especial and peculiar pathology is, or is not, worthy of their attention as men of science; and to-night my story must be that of our rocks and fossils, a story which I think will prove of interest, if I do not mar it sadly in the telling.

That a picture may be pleasing and artistic, it should embody both harmonies and contrasts. There must be portions where the lights and the shadows are brought into forcible opposition, and there must be portions, also, where the same melt, almost imperceptibly, the one into the other. In choosing a suitable field for scientific enquiry something similar is looked for. We expect to discover what is altogether new, forming the contrast (what an artist would call his "strong points"), and to meet with many phenomena, which prove old acquaintance, which, in like manner, answer to the harmonies equally conducive to picturesque effect. To show that discoveries of both these kinds are likely to reward the Geologist in Victoria is the task undertaken in the present paper.

Commencing with what is commonly looked upon as the very lowest rock, we find that granite is by no means sparingly developed in this portion of the world. Generally, however, it is not a favourite subject for study. In most text books the same is regarded as a sort of foundation upon which the entire superstructure of geological formations is erected; the floor on which the newer rocks have been spread out, if not the grand storehouse from which the debris—now hardened into stony masses—has been obtained. It is often, furthermore, spoken of as the solidified crust of a once entirely molten globe. Because this last opinion is just now rather warmly controverted, the careful study of granite bids fair to become one of more than ordinary interest. It is, you will remember, commonly formed of three separate constituents, quartz, mica, and felspar, and these are not found to assume any definite order, but are promiscuously scattered, in distinct crystals, throughout the entire mass. This arrangement was long supposed to be a result of the separate ingredients crystalizing while the whole, under enormous pressure, cooled slowly from a state of fusion. It is argued, however, by no less a chemist than Dr. Percy, that the contained quartz, at least, is evidently rather of aqueous than of igneous origin. In support of this theory, quartz, or more properly silica, is said to assume two separate forms, the crystaline and the amorphous. The former, in which is included flint and chalcedony, together with regularly crystalized quartz, has a high specific gravity, 2·6, is almost insoluble, even in hot alkaline solutions, and has often been most unmistakably formed from a liquid menstrum. The latter variety, on the other hand, is of low specific gravity, 2·2 or 2·3, is soluble to a great extent, and is the very form assumed when small particles of silica have been melted by an intense heat. Now the quartz of granite is ever of the former, and never of the latter kind, and, whilst distinct crystals of quartz have been repeatedly produced in what is called the wet way, all attempts to obtain them by fusion have signally failed.

The foregoing is one of the objections recently raised against the old fashioned theory. Further occasion will be given for alluding to the subject under the head of quartz veins, but respecting the tenability of the hypothesis I must not venture an opinion. My reason for alluding to it at all is, to show that in any discussion of that matter that may arise, we Victorians are not likely to be shut out of the controversy by lack of materials for study or illustration.

On this granite as a foundation are superimposed the palæozoic, if not the azoic strata. Whether the latter really deserve the name, and were actually laid down previous to the existence of life upon our planet, is a question which Victorian observers may aid in solving. Rocks barren of fossils in one land may be filled with organisms to repletion in another. Miners, therefore, whose occupation leads them to delve deeply into these ancient deposits, may, I think, really serve the cause of science not a little by carefully noticing whether the rocks do, or do not, present traces of a life long since passed away, and which, in most parts of the world, has left no record of its existence whatever.

With the lower silurian beds the work of the palæontologist really commences. In a brief essay (which I have never read without anathematizing the powers that be for not allowing it to be longer) attached to the Catalogue of the Victorian Exhibition for 1861, Professor M'Coy particularizes no less than eighteen distinct species of graptolites, strangely matching with those of similar beds in Europe, America, and other distant portions of the globe. What is still more singular, associated with particular kinds, *Diplograpsus, mucronatus*, and *D. pristis*, there is found in the Bala strata a small bivalve *Siphonotreta micula*, whilst in similar slates in Victoria the same forms of graptolite have been met with, and, strange to say, similarly associated. The *Orthoceras bullatum*, peculiar to the Ludlow rocks in England, has been met with in the equivalent beds of Collingwood. At Broadhurst's Creek, near Kilmore, the trilobite *Phacops longicaudatus* matches with the same species from the Wenlock shales of Shropshire. Not long since, too, I had the especial good fortune to meet with, in the Moonee Ponds cliff, more than one fine specimen of *Homolonotus delphinocephalus*, a kind of trilobite which seems to be losing the distinguishing marks of its family (for the trilobation is almost obliterated), which is especially characteristic of the Upper Silurian strata, to which the Moonee Ponds beds belong. In the same locality I also found numerous specimens of a small species of encrinite, which, if I did not misunderstand him, Professor M'Coy considers identical with a species lately brought to light in Canada. With these old fashioned forms, however, are found other organisms altogether strange, some of which, to quote, I think, Mr. Selwyn in the *Journal of the Geological Society,* are not only of entirely new species, but require, in order to class them, that new genera should be formed.

The former of these instances illustrates the harmony referred to. The latter, in like manner, is no less typical of the contrast. The one singularly proves the unerring truth of sound palæontological deductions. The other offers to the votary of the science "fresh fields and pastures new" wherein to prosecute his studies, ever giving promise of discoveries which are the legitimate and sure reward of all searchers after knowledge made in a right direction. In the first case we are startled to find that, at that distant period, countries so widely separated as England, Canada, and Australia, must have enjoyed an almost identity of climate. In the second we are delighted to meet with fresh proofs of that almost infinite variety, characteristic of nature's works, from the earliest geologic ages down to the present time.

I had intended to speak of the somewhat remarkable contortions peculiar to the foregoing rocks, and to offer a few remarks upon what, to me, seems to have been the cause of them ; but I hope, ere long, if you will allow me, to submit to your notice an especial paper upon the subject. The contortions in question have, however, left traces of a bygone physical conformation of country, which I am strongly tempted not to pass unnoticed.

The scenery of the greater portion of the colony presents but few bold features. Were it not for a number of mammillated volcanic hills, the whole of the district south of the Dividing Range would have the aspect of a widely extended plain. This, however, could not always have been the case. Near Johnston-street bridge, for example, there is a deep cutting extending from the Yarra, for at least half a mile, into Studley Park. During the first few hundred yards the beds, nearly perpendicular, lean slightly towards the east. They then form a sort of anticlinal, the beds on the side nearest Kew dipping in an entirely opposite direction. Now the beds being at one time horizontal and continuous, must have been broken over the knife-like edge of the anticlinal, forming, hereabouts, a valley of fracture, bounded on the east and west by two lofty hills, several hundred feet in height. This will appear at a glance by the section before you. A similar cutting off of the crown of a hill is shown at Moonee Ponds, at Aitkin's Gap, and in numerous parts of the colony. Picture, then, this same district in its pristine state and elevated as dry land. We shall have a scene remarkable for its picturesqueness. Broken up by hill and dale, the mountain tops attracting the cloud and courting the shower; down the sides of the steeper precipices would roar the torrent, and along the valleys would flow the stream; the whole having a climate strangely different from that of Australia now. Partially sink the area, and there would appear an archipelago of islands, with winding channels, deep bays, and romantic fiords, bounded by rocky shores slowly crumbling away. Submerged still further, and Victoria will be an ocean bottom of varying depth, generating currents, and forming the habitat of strange denizens of the waters, as these preferred homes upon the foam-washed rocks, or in the deeper sea.

This, the Silurian, formation is of great practical interest, from the fact that it is the original matrix of the quartz reefs whence all our auriferous treasures are derived.

First of all, then, a question of great moment presents itself. Do the reefs referred to, or do they not, decrease in productiveness as they descend? Not a little has been said upon the subject, and not a little bad temper towards geologists has been displayed. It is a problem the practical importance of which I can indicate to you, even whilst no attempt is made to afford an answer. In cases where I have put pointed queries upon the subject, the replies received have been various and conflicting. One thing, however, I often noticed. Those having shares to sell were much more enthusiastic anti-Murchisonians than those who wished to purchase.

But there is another question quite worthy of the geologists attention, namely, the probable origin of the quartz veins themselves, and how the same first came to be impregnated with the precious metal.

Before you is a quarter sheet of the Government Geological Map, showing the district near Castlemaine. The purple tinted portions indicate the development of the Silurian strata. Over these parts are scattered a vast number of black lines, looking, as they are drawn, not unlike the flights of arrows in some ancient battle piece. These are quartz reefs. They have nearly all a meridional direction, a feature in reefs by no means peculiar to this district alone.

Here again are respective sections of Steiglitz, Sandhurst, and Ballarat. The purple tints also represent the Silurian rocks. The blue branching lines, crossing the strata, are the same quartz veins as viewed in section. A little attention will lead one to conclude that these veins are simply fissures, subsequently filled up, and, as I imagine, that the filling up has taken place from below, and not from above. The Huttonian school, of which Mr. Rosales appears to be a disciple, refer the filling up to masses of heated and molten quartz, just as, on a small scale, fluid metal runs into the interstices of a mould, or, on a larger one, trap dykes are formed in the fissures of modern volcanoes.

Mr. Davison, referring to the origin of gold-bearing veins, supposes that the quartz and the gold were together forced up from beneath, whilst both were in a liquid state, by some powerfully eruptive force. So long as the quartz continued to flow upwards it might reasonably be expected to hold the contained gold in a state of suspension, but when the force below, and with it the upward motion, ceased, the heavier substance, that is, the gold, would naturally sink downwards by virtue of its superior gravity. Some portion of the mixture would be forced completely outside the fissure, and the gold contained therein, the quartz being subsequently disintegrated, would give rise to the rich gutters and nuggets peculiar to what are known as the deeper leads. The top portion of the vein would cool rapidly by contact with the atmosphere, and the fluid thickening, must necessarily entangle much of the gold, thus preventing its sinking downwards, just as rapidly as cooling wax retains in suspension shots which otherwise would sink speedily to the bottom. This portion of the vein being in time broken up, would form gold drift No. 2, generally of great richness, but inferior in productiveness to the one below. Then in time the lower, and, consequently, the poorer part of the vein, would be worn down, giving rise to the upper drift, still poorer, but apparently more productive of larger nuggets than any portions of the reef now remaining *in situ*.

This is a somewhat ingenious theory. It accounts for the presence of the gold, and for the supposititious phenomenon that the same becomes less plentiful as we descend. It explains, too, the schlicken or scratched sides found on many reefs, for if the reefs were thus once heated, they must necessarily contract greatly after their formation, and so contracting, would grate against the adjacent rock; hence the longitudinal striæ now characterising their casings; whilst the whole is strictly in accordance with the Huttonian hypothesis. The pity is that there are a few facts telling much more against the theory than in its favour, as, for example, close adjacent to the veins themselves—I quote Mr. Selwyn's speech before the Mining Institute, reported in the *Mining Journal*—are found delicate fossils still unchanged in any way; a proof, it would appear, that the strata have never been subjected to the intense degree of heat supposed. Then, again, there are branching veins so thin that they never could by any possibility have been filled in as molten material, since such material cooling would have solidified and choked up the passage, as a long thin mould will cool and choke up during a casting. But, lastly, it is urged by Bischof, that the rocks which the veins traverse are often composed of materials, allumina and lime, which readily form a mixture with the silica, more easily melted than is either silica, lime, or allumina by itself.

"If," says that writer, "we pour molten silver into a mould of lead, part of the lead will be fused and form an amalgam with the silver, so we may expect that, if formed as supposed, by igneous agency, instead of pure quartz veins, there will be found veins composed of quartz in a state of mixture with more or less of the materials of the rock through which they pass."

Setting on one side the igneous theory, it is most natural to refer the phenomena to the action of water.

If, however, quartz is difficult to fuse, it is still more difficult to solve. Nevertheless, although this is the case with the pure material, the same, mixed with proper fluxes, is easily reduceable. Together with potass or soda it forms glass, a by no means refractory substance. Whilst, by increasing the proportion of alkali, we actually obtain a substance not only readily fusible, but capable of being dissolved and held in solution by either hot or cold water. It is, in fact, the water glass, well known in the laboratory, and lately brought into notice from its supposed quality of hardening and preserving otherwise friable sandstone.

Some few difficulties, too, of the aqueous theory have lately been explained away by a tolerably well-known process, alluded to by Dr. Percy, in his late course of lectures on Chemical Geology.

If to an aqueous solution of water glass, which may be perfectly clear, we add, in a certain manner, an acid, the same will combine with the alkali present, and the contained silica will be thrown down in the form of a jelly. But when the acid is added in another way, the silica is not precipitated. If, then, we take a small hoop of gutta percha, having a bottom formed of parchment paper, and place the same floating in water, and if, whilst so floating, we pour into it some of the last mentioned liquid, we shall have the following result. The acid and the alkali will pass through the paper, as will also a small portion of the silica, but another portion of the latter will remain and be suspended in the water. In many instances as much as six per cent. remained so dissolved, and that without there being the slightest particle of base to thus keep it in solution. This is the process of dyalisis, and when, as is stated in the lecture referred to, it is found that all the conditions of the artificial process are likely to exist in a state of nature, there is reason to suppose that the solution and redeposition of vast masses of siliceous matter, by aqueous agency alone, are by no means so difficult as was once imagined.

There is another way, but as I have never heard the same put forward by any writer on geology, you will please to receive the same with caution, and consider it rather as a query put to elicit truth, than as a dogmatic assertion explanatory of a difficulty.

May not both aqueous and igneous agency have come into operation? May not the silica, mixed with lime, alumina, and potass, as fluxes, have first, as a fluid mass, filled the fissures; and may not the same have been subsequently metamorphosed and altered to its present form by the removal of the flux in question?

As bearing upon this portion of the subject, permit me again to draw an illustration from Dr. Percy's lectures. It is the account of an experiment descriptive of the artificial production of staurolite. A porcelain tube was taken, and after being filled with alternate layers of alumina and silica (as in sketch), the whole was placed in a furnace and maintained at a red heat, whilst a continuous stream of fluoride of silicon was made to pass through it. On the tube being broken up, it was found to contain, not separate layers of the two elements, but a compound formed of both silicate of alumina or staurolite, as required. The rationale is as follows: The fluoride first deposits its silica in the alumina, taking up alumina instead. It is then fluoride of alumina, and passing on through the next layer it is changed back to its original form, fluoride of silicon, by giving up the alumina, and re-appropriating the silica to itself. This process is repeated many times in passing through the tube, and at last the gas issues from the one end as it entered at the other, fluoride of silicon.

Here, then, is a metamorphosis not unlike the one required. There are plenty of veins, too, answering to the supposed first condition of the reefs of quartz, and veins generally referred to igneous action. Such are the elvan dykes, the principal constituents of which are, if I am not mistaken, silica and potass. There are two of these dykes near the Botanical Gardens, two cross the Moonee Ponds Creek above Flemington, and others are by no means uncommon in various parts of the colony. We now want some permeating gas or fluid to remove the foreign substance, so as to leave the quartz in a state of purity. This requirement might, perhaps, be met by high pressure steam or superheated water. The whole, however, is, as I told you, merely suppositious, and you will therefore discuss it or dismiss it as unworthy of notice, as seems most fitting to you.

Near Bacchus Marsh, in the gorge of the Werribee, rocks are met with which Mr. Daintree classes as upper palæozoic, and speaks of as possible equivalents of the old red sandstone. It is this same series of strata which, in Great Britain, were once thought to be barren of organic remains, but which yielded the Scotch geologist, Hugh Miller, such an abundant harvest of unique forms. It will be interesting to see whether still fresh additions to the ichtholites of the period are to be made by the Victorian beds, and to observe what novel shapes the *plerichthys* or *cephalaspis* will take when located as denizens of the Antipodes.

By the Geological Map I see that these same beds are classed as permian, so that it may be supposed their age has been determined by the geological survey. They present, however, another problem of no little interest. Are they, or are they not, auriferous? Mr. Daintree speaks of them as "seen resting on the upturned edges of the silurian slates and sandstones, with their associated quartz reefs, which do *not* pass into the overlying conglomerates (*i.e.*, of the permian beds). The drift of the valley has been worked for gold, proving the auriferous character of the reefs; and here we should be able to work out the relative age of the gold." And this question, especially as viewed in connection with the theory of quartz reefs being richest near the surface, is one of no little practical importance. If, as I think, we must conclude the lowest tertiary drift is the richest, because it is formed of debris gathered from quartz lying high in the reef, how much richer may we not expect to find that drift which, by being accumulated in palæozoic times, must necessarily have occupied a much higher position, and, consequently, have been still more charged with auriferous particles. The difficulty will be to find this drift, hid as it must be below vast thicknesses of the old sandstones.

Upon this series of rocks repose the so-called carboniferous strata of the colony, and which are generally referred to the mesozoic period. The true age of our own beds seems now to have been definitely settled, but this is scarcely the case with what may be termed the kindred deposits of the sister colonies. In Hobart Town are a series of sandstones, shales, and coal seams, very like our own. They lay conformably, though at some distance above, a deposit of lime-stone, thought to be Devonian, or at least lower carboniferous. It is hardly to be supposed then but that these facts, together with the often-cherished overweening desire for an ancient lineage, should induce our neighbours to go just a little mad, or at least to display a little amount of unreasonableness, in claiming a high antiquity for the ground they tread on.

In a former paper, read before this Society, I mentioned the finding of certain Batrachian remains in these beds, which go far, as it would appear, to settle the disputed point, and prove that the coal is rather of the secondary than of the true carboniferous period.

In New South Wales the same question is by no means so nearly decided. Great authorities declare for the beds being mesozoic, and great authorities also have declared the other way. I hope to show you the practical bearing of all this directly.

We have here, then, in two out of three colonies, coal beds known to be mesozoic, and in the third, large deposits of coal which is said to be of the true carboniferous type. In no country does it appear that the newer deposits of coal equal the older in richness; and in this part of the world, what are said to be of the latter age are by far the most extensive. In Victoria, the whole of the carbonaceous rocks (Oolitic) are but sparingly developed. If no really palæozoic coal is discovered in any of the adjacent colonies, the natural presumption is that, at the time when the true carboniferous vegetation flourished, this continent was either sea, or not in a condition to nourish that especial vegetation so luxurious elsewhere. All hope, therefore, of finding palæozoic coal would seem in vain, and no one would care to look for the mineral out of what are known to be mesozoic districts. But say that the Sydney beds are really of the older class. Then there is proof that some part of Australia has been covered by *bona fide* coal plants, and there is reasonable ground for hoping that in our older rocks, the sandstones of Bacchus Marsh, of the Grampians, and of North Gipps Land, rich deposits may be found entombed, and rivaling in value and importance the stores of mineral fuel incidental to England, to America, and to Continental Europe.

And if the other theory, that the Sydney coal is Oolitic equally with our own, be true, is there nothing gained—practically, I mean—by having the matter decided ? Is the whole a mere question for dilettanti geologists to squabble over ? I think not. We shall be something like a merchant who, in the midst of a crisis, takes stock and finds his balance on the wrong side. Not a pleasant discovery, but far better than ignorance as to the real state of affairs. It is the coward only who flies to the opiate or to the brandy bottle in time of trouble. The brave man longs to see the danger, so that he may face it, and by facing it boldly avert it wholly.

Above the last mentioned rocks there occurs a blank. The upper Oolitic and all the Cretaceous group seem, in Victoria, to be wholly unrepresented. In our tertiary deposits we stand once more upon old and well-known ground. The clay beds of Mornington appear the probable representatives of strata found below both London and Paris. The lower miocene near Geelong presents us with a fauna of a very decidedly tropical character. The more singular and the more interesting since, by the equivalents of these beds elsewhere, such climate seems in that age to have been almost universal. Even the more superficial deposits of our continent present features well worthy of consideration. In the pliocene drift of Queensland and of South Australia, there occur bones of gigantic mammals, worthy contemporaries, as you can see by comparison of their respective crania as preserved in our National Museum, of similarly gigantic fossil animals found on other continents. Nor is it less remarkable that, as in South America, the huge Megatherium, by its sloth-like form, was evidently closely allied to the sloths which have succeeded it on that continent; so our own Deprotodon, by being a marsupial, seems a fitting prototype of the Australian mammals of the present epoch. I cannot see my way at all clearly as a developmentist, but I am greatly mistaken if the above-mentioned fact does not tend, at some future day, to throw no inconsiderable light upon the origin of special forms in creation.

I have been thus brief in treating of the tertiary rocks, not because they are devoid of interesting features, but that my paper is already extended to inordinate dimensions, and there is yet much to say.

Interstratified with these last, the tertiaries, is a class of rocks, the basalts, of quite another character to any yet spoken of. I need hardly tell you that these are certainly of an igneous origin. They are of varied ages, and occupy no inconsiderable or unimportant position in Victorian geology. A glance at the map will show their conformation, and the very wide tract of country which they cover. In fact, nearly the whole of South Western Victoria is occupied by them, either as a superficial stratum, or as overspread by a thin capping of tertiary deposits.

The basalts are singularly interesting, by the light they appear to throw upon the power of water to erode and eat away the most indurate materials. This is especially noticeable along the coast line near Cape Schanck, where high cliffs of this rock are worn and fretted into shapes the most fantastical. At Fyan's Ford, near Geelong, similar results are apparent, the more remarkable that here breakers and waves could have played no part, and that what is witnessed is simply traceable to the trifling, though continual, action of a tiny stream. At Keilor, too, there is a deep and wide gorge, referable to the same causes. No. 1 represents it in plan and in section.

The cliffs on each side are formed of three different layers of strata, each of which must have been continuous across the valley. At the base is seen the Silurian strata, much contorted. On this reposes a tolerably thick bed of siliceous tertiary rock (the most indurate I ever saw), and on the whole is superimposed a layer of basalt. The entire cliff must be over a hundred feet in thickness, yet the valley bounded by it has evidently been scooped out by the action of the insignificant stream of the Deep Creek, and it is difficult to conceive how that stream, with the present configuration of country round, could have been much greater than at present. Our only resource, therefore, is in an extension of time, and an extension of time so vast that the geologist, pretty well used to contemplate lengthened periods, and the astronomer, who is alike accustomed to meditate upon space as of infinite extension, stand aghast at its immensity.

And yet these same basalts are some of the newest rocks of Victoria. We frequently hear of wood, similar to that still found in our forests, being dug up from beneath a hundred feet of tertiary gravel and bluestone. Near Warrnambool dried grass is found below a solidified stratum of lava. Even the beds lying beneath the basalt of Keilor are all of the newer tertiary epoch, so that this work of denudation and cutting through the three several masses of strata spoken of must all have been accomplished since the time when the English crag deposits were laid down. But the time elapsing since this period is but an infinitesimal fraction of the whole geologic epoch. Who then shall count the ages which have rolled slowly onward since the primeval granite nakedly bore the brunt of the first tempest, and the first atom of azoic strata found a resting place in some sheltered nook of that ancient ocean.

A few mails since I had the honour of receiving a letter from Professor Rupert Jones, in which he remarked upon the especially interesting features manifest, as illustrative of the modern theories of erosion and fracture, in the gorges referred to ; at the same time expressing a hope that Victorians would not only carefully observe them, but also communicate the result of their observations to the English scientific world. I mention this, to show that in our own, and by many, despised geology, there are peculiarities which the princes, if I may so speak, of European science would be only too ready to explore.

The same strata are interesting also as being the proximate cause to which our capabilities as a corn, oil, and wine producing country are clearly traceable. In Kent and Sussex rich agricultural land is formed by the natural admixture of debris from Wealden, Greensand, and Cretaceous outcrops. Scotland owes its fertility to the boulder clay. Egypt is rendered the corn-field of Africa by a geological cause also—the periodical deposition of mud from the waters of the Nile. The barrenness of our own tertiaries is counteracted by a provision equally geological and equally efficacious, yet a provision which in the process of its development promised but little, nay, which seemed rather likely to result in a region especially blasted and desolate.

The philosopher, eager to trace the harmonious working of cause and effect, could not but have been charmed to witness the grand chain of events as hitherto developed, events sublime in their monotony, and interesting even in their sameness ; but the most enthusiastic optimist might be excused for a feeling of despair whilst surveying what had been done and what so far had resulted. It was (previous to the era of these last igneous rocks) the chapter of Victoria's history where all grew most confused, the act of the great drama where all appeared most disheartening. There had come to be a state of climate, of animal life, and of vegetable existence, suitable to the wants of man ; but this especial scene could surely never be rendered a fit place for man's habitation. Many changes had occurred, but none seemed for the better. In place of the desert of one rock there had come to be the desert of another, or at best, wide arid wastes. On the former, trees of stunted growth might stud the surface. On the latter, a little grass or heath, like that near Brighton, would struggle for existence. Nature working so slowly, yet so surely, now seemed to have worked in vain, and each new point rising above the waves appeared but as a region of desolate rock, or gave rise by decomposition to dreary dunes of blown sand.

And then the time seemed to have been fulfilled. The natural forces, which hitherto had acted quietly and silently, now swelled the district into hills, and split the surface into chasms. A little smoke would give the earnest of the coming storm, then a shower of ashes, thrown from a newly formed crater, would blast the forest and overwhelm the plains, and lastly, amid the thunders of volcanic eruption, would be poured forth the stream of fluid lava. It would flow onward in a desolating scorching flood. It would lay long as a wide-spread molten lake, on which no breathing thing could pass and live. Then, cooling slowly, the same would remain for ages as a black cindery mass, a Sahara in barrenness, a Gomorrah in desolation.

Then, at last, just as the old granite hills slowly crumbled and yielded their *debris* to form the lower rocks, so would this solidified lava also be disintegrated into mould and clay, slowly but surely forming a soil above the indurate mass below, and the succeeding changes of almost infinite ages thus culminated in developing the fertile district of Victoria, which future generations, if not our own, will see, fruitful with the olive and the vine, blessed as the beauteous home of a prosperous and happy people.

I feel, gentlemen, that I owe the Society an apology for this long and discursive paper, one, too, in which I fear the professed geologist will find but little that is new. My object, however, has been to indicate where enquiries can be made, rather than to offer any very profound theories or very novel facts. I have long felt that the particular science, the claims of which I advocate, has been too much neglected in this colony. That profit and pleasure are to be derived from its study is what I have sought to show. Its use must be patent to every one who looks upon our own as a mining or an agricultural country. When a Victorian Miller or Mantell shall arise amongst us, such individual need be at no loss to find materials for a work quite as interesting as the *Old Red Sandstone*, or the *Medals of Creation*. Such a treatise may have all the charms of an imaginative work without departing from the strict line of geologic fact. But until this comes we need not be idle, nor on this subject need we be dull. Our stony treasures are as great as those of other lands. The story of our rocks and of our fossils is well worth listening to, or even digging out if requisite. The field is a rich and an ample one. He who toils in it enthusiastically and with a will, need not toil in vain, for of it may be said, " The harvest is indeed plenteous, though the labourers are few."

Art. II.—*On the Probable Erosion of the Mountain Ranges of Gipps Land.* By Thomas E. Rawlinson, Esq., C.E.

[Read 3rd July, 1865.]

Having had occasion during the latter half of the years 1862, 1863, and beginning of 1864, to travel over the country lying between Sale and Jericho, in various directions, my attention has been directed to the peculiar character of the mountain fastnesses of that region, and also to some extent to the mountain ranges extending northerly from Sale, as a centre, up into the Omeo country.

It is not my purpose to do more to-night, than allude generally to the similar external character of the Omeo routes with those of the country traversed by the tracts to